## A 10 K Multistage Cryocooler with Very Low Vibration, Phase II



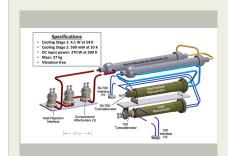
Completed Technology Project (2017 - 2020)

#### **Project Introduction**

Advanced space borne instruments require cooling at temperatures of 10 K and below. Potential missions include the Origin Space Telescope and the Superconducting Gravity Gradiometer. Cooling loads for these detectors will range from 50 mW to 500 mW at the primary load site, with additional loads at higher temperatures for other subsystems. Due to jitter requirements, a cryocooler with very low vibration is required for many missions. In addition, a multi-stage cooler, capable of providing refrigeration at more than one temperature simultaneously, can provide the greatest system efficiency with the lowest mass. To address this need, we plan to develop and demonstrate a two stage turbo-Brayton cryocooler that provides refrigeration at 10 K, with additional cooling at 50 to 70 K. On the Phase I project, we optimized the performance of an existing cryocooler and measured its performance. During the proposed Phase II project, we plan to optimize key cryocooler components for operation in a 10 K cryocooler, and demonstrate the performance of the advanced technology through demonstrations at cold load temperatures of 10 K and below. We will use these test results to develop a design for a fully optimized, flight cryocooler for a particular NASA mission class.

#### **Primary U.S. Work Locations and Key Partners**





A 10 K Multistage Cryocooler with Very Low Vibration, Phase II Briefing Chart Image

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#### Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Туре	Location
Creare LLC	Lead Organization	Industry	Hanover, New Hampshire
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations		
Maryland	New Hampshire	

#### **Project Transitions**

May 2

May 2017: Project Start

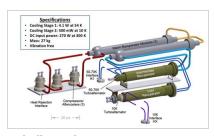


February 2020: Closed out

#### **Closeout Documentation:**

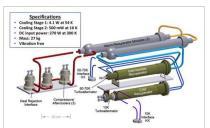
• Final Summary Chart(https://techport.nasa.gov/file/141100)

#### **Images**



#### **Briefing Chart Image**

A 10 K Multistage Cryocooler with Very Low Vibration, Phase II Briefing Chart Image (https://techport.nasa.gov/imag e/136644)



#### **Final Summary Chart Image**

A 10 K Multistage Cryocooler with Very Low Vibration, Phase II (https://techport.nasa.gov/imag e/127329)

# Organizational Responsibility

# Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

#### **Lead Organization:**

Creare LLC

#### **Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## **Project Management**

#### **Program Director:**

Jason L Kessler

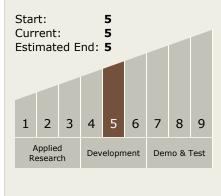
#### **Program Manager:**

Carlos Torrez

#### **Principal Investigator:**

Mark Zagarola

# Technology Maturity (TRL)





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# **Technology Areas**

#### **Primary:**

- TX08 Sensors and Instruments
  - ☐ TX08.1 Remote Sensing Instruments/Sensors
    - ─ TX08.1.6 Cryogenic /
      Thermal

# **Target Destinations**

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System

